



A WHOLE LOT OF SHAKIN' GOIN' ON

ENGINEERING PROFESSOR EXAMINES HOW BARRELS STACK UP

BY TERESA HENDRIX

IN ONE OF THE NEWEST SPACES in the Advanced Technology Laboratories on campus, a professor and a team of students are blending winemaking, engineering and earthquakes.

It may sound like an odd mix, but in fact it's a research project with plenty of punch.

Structural engineering Professor Charles Chadwell is looking for ways to prevent wine barrels from toppling and breaking during an earthquake. Standard industry practice in California is to age wines in oak barrels stacked on portable metal racks, Chadwell explains.

Wineries commonly stack the barrels five, six, seven – even eight high.

It's a tradition that may work fine in France – but it doesn't always work well in earthquake country.

Many Paso Robles-area wineries found that out Dec. 22, 2003, during the 6.5 San Simeon earthquake. Wine barrels shook, rattled, rolled and fell all over San Luis Obispo County, particularly in areas closest to the epicenter. Thousands of gallons of wine spilled from broken barrels, causing hundreds of thousands of dollars in loss and damages. At Wild Horse Winery, a worker was buried under a pile of fallen wine barrels. She was rescued after crews drained the barrels and rolled them off.

Just two days before the quake, Chadwell had submitted a grant proposal for a wine barrel earthquake research project. The project was quickly granted \$40,000 from Cal Poly's C3RP technology park research program for junior faculty. In addition to the grant, Mondavi wineries donated wine barrels, and storage-rack maker Topco Inc. donated portable steel wine barrel racks.

The new wine barrel lab at the ATL is equipped with a “shake

table” and a hydraulic lift, along with sophisticated computer equipment. The setup recreates movement from actual earthquakes, including the 1994 Northridge earthquake.

Chadwell and engineering students Jeremy Stanley, Mark Philipps and Townsend Brown have been stacking 600-lb. wine barrels filled with water two, three and four rows high, recreating quakes, and recording what happens. They're working their way up to a five-barrel tower test.

The goal of the research project, Chadwell says, is to come up with a mathematical formula and model for winery earthquake loss estimations. “For a particular winery, if we know the kind of soil the winery is on, the distance to the closest earthquake fault, and the maximum earthquake that fault can produce, we can use the model to assess the monetary risk of an earthquake,” he explains.

Wineries could then contrast the risk against the cost of modifying their wine barrel storage.

With the data they've gathered so far, the professor and his students have come up with new ideas on how to make stacks of wine barrels safer during earthquakes. They're seeking a patent on one of them. Chadwell and the College of Engineering are planning to invite winery owners from the Central Coast and Napa and Sonoma counties to the lab this spring for a demonstration – and some wine and Cal Poly cheese.

For Chadwell and the students, the project is a chance to come up with a solution to a real-world problem. “We were looking for a project that would benefit industry, and with Cal Poly's location in wine country, this was just a natural,” Chadwell says.

And besides, as a cabernet sauvignon fan, “I hate to see a good barrel of wine go to waste.” ■

(Left to right) Jeremy Stanley, Professor Charles Chadwell, D. Townsend Brown and Mark Philipps